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ABSTRACT

This manual contains a work sample intended to screen handicapped students' interest in and to screen interested students into a training program in basic electricity. (The course is based on the entry level of an electrician helper.) Section 1 describes the assessment, correlates the work performed and worker traits required for completing the work sample, and lists related occupations and DOT codes. Instructions to the evaluator are provided in the next section. The conditions and administration equipment are detailed, and the set-up and breakdown procedures are illustrated. The section on administration provides a student orientation including student material with an explanation and illustration of equipment and/or procedures. Instructions for task procedures actions to be taken, as well as post sample interview topics are also covered. Section 4 explains the method of scoring and provides forms. Section 5 lists technical data (norms, reliability, validity) to be included in a supplement to this manual. Contents of the section on maintenance and construction include information on tool and equipment maintenance, a materials list (equipment, source, price), and assembly instructions. Section 7 cites references. An appendix defines terms. (YLB)

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ELECTRICAL WIRING

Work Sample

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I. INTRODUCTION

A. Assessment Description

The Electrical Work Sample is intended to assess a student's interest in and screen interested students into a training program in Basic Electricity. This course is 36 weeks in length and is based upon the entry level of an Electrician Helper job - - - (DOT 829.684-022).

The job of Electrician Helper falls within the occupations in installation and repair of electrical products n.e.c. (829), Occupational Group Arrangement and Elemental Work, Mechanical, Worker Trait Group (05.12).

It should be kept in mind that following are the various activities and worker traits that are associated with an Electrical Helper. Most of these activities and worker traits would also be required of a student working in a Basic Electrical Course, only with less demands.

Also, it should be understood that many of the worker trait values would be higher for the Electrician Helper than the student in the Basic Electrical Course.

The work performed and Worker Traits required for completing the Electrical Work Sample are as follows:

WORK PERFORMED	WORKER TRAITS REQUIRED	
1. Attaches tubing connection to electrical work box	GED	2
	SVP	2
	APT	G-3, V-5, N-4, S-4, P-4, Q-5, K-4, F-3, M-3, E-5, C-5
	WA	1, 9
	WS	8, 10
	PD	S, L, 4, 6
	WC	I, 5
2. Feeds electrical wire through tubing connector and strips 1/2" insulation from ends or from gauge on duplex outlet.	GED	2
	SVP	2
	APT	G-3, V-5, N-4, S-4, P-5, Q-5, K-4, F-3, M-3, E-3, C-4
	WA	1, 9
	WS	8, 10
	PD	S, 4, 6
	WC	I, 5
3. Secures wires to duplex outlet	GED	2
	SVP	2
	APT	G-3, V-5, N-4, S-4, P-5, Q-5, K-4, F-3, M-3, E-3, C-5
	WA	1, 9
	WS	8, 10
	PD	S, 4, 6
	WC	I, 5
4. Attaches electrical duplex outlet in electrical work box and then attaches electrical plate to electrical duplex outlet	GED	2
	SVP	2
	APT	G-3, V-5, N-4, S-5, P-5, Q-5, K-4, F-3, M-3, E-3, C-4
	WA	1, 9
	WS	8, 10
	PD	S, 4, 6
	WC	I, 5

B. Related Occupations

Electrical Work Sample

DOT description

ELECTRICIAN HELPER (829.684-022)

Related Occupations

DOT Code

ELECTRICIAN, HELPER

829.684-026

ELECTRICAL REPAIRER

829.281-014

CABLE-SPLICER, HELPER

829.667-010

BATTERY INSPECTOR

829.684-010

CABLE-SPLICER APPRENTICE

829.361-014

CABLE-SPLICER

829.361-010

II. INSTRUCTIONS TO THE EVALUATOR

A. Work Sample Conditions

The Electric Work Sample is to be administered indoors with no noise constraints from neighboring areas such as in the Industrial Arts areas. Good overhead lighting is helpful but not required. The work sample involves light work, and must be performed by a person with both hands or one who has equivalent manual and finger dexterity from a chair or wheelchair. This work sample is designed to allow the evaluator to be able to determine whether the student has the necessary skills to pass a Basic Electrical Course in a high school successfully. The work sample is not physically hazardous in any way, and requires no safety equipment although all health and safety precautions should be adhered to regarding Occupational Safety and Health Act requirements as well as those safety factors which may be encountered in local industry and unique job requirements.

B. Administration Equipment

The following equipment is required prior to administration:

Evaluator equipment:

- Stopwatch
- Manual for the Electrical Work Sample
- Task observation sheet

Student equipment:

- 6 ft of #14 wire or similar (#12, etc)
- 1 work box (electrical)
- 1 duplex electrical outlet
- 1 framing stud (2 x 4 x 2 ft)
- wire stripper (multi-gauge)
- Benchvise or clamp - 6"
- Screwdriver - 6"
- Electrical plate (metal)
- #10 X 1/2 woodscrews - panhead (2)
- 3/4 tubing connector
- 4" awl

C. Setup and Breakdown

The correct setup and breakdown procedures for the electrical work sample are as follows:

The student sits or stands in front of the table or bench with the frame tightly locked in a bench vice on the table or bench so that it is comfortable for the student to work. The tools are placed in the side of the Electrical Work Sample also for ease of usage by the student.

An illustration of correct setup for the Electrical Work Sample is shown in Figure I.

While giving instructions and pointing out work sample parts, the evaluator stands to the side of the student

not to obstruct the student's view of the work sample. No alterations are required for wheelchair persons.

When the work sample is completed, the evaluator inspects and scores the work done by the student. The work sample is broken down by removing the electrical plate and duplex outlet, disconnecting the wires from the duplex outlet, removing the wire from the electrical work box and removing the tubing connector from the electrical work box. Finally, the tools and fixtures should be placed as the evaluator instructs.

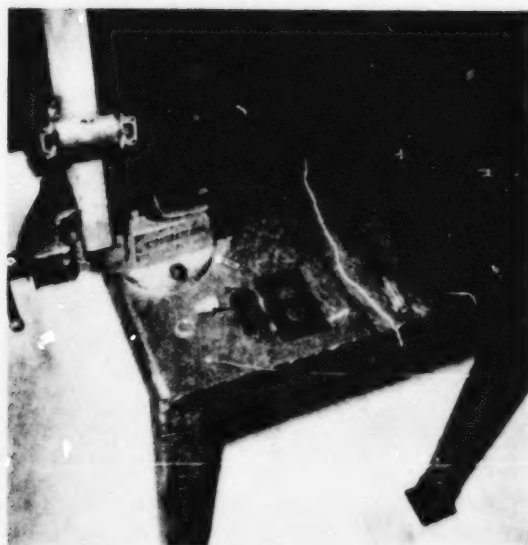


FIGURE 1

Timing Procedures:

The Work Sample is timed from the moment the student signifies he understands the instructions and indicates that he is ready to begin, until he puts down the handtools and indicates that he is finished.

Quality Checks:

Quality is checked by the evaluator through visual discrimination to assure that the conduit connector is correctly attached, the wires are stripped correctly and that they are correctly attached to the duplex outlet. Final evaluation is to observe whether the student fastened the duplex outlet and electrical plate to the electrical work box correctly.

III. ADMINISTRATION

A. Student Orientation

Read or paraphrase the following information to the student:

The work sample that you are going to do is called the Electrical Work Sample.

The work you will be doing on this work sample is like the electrical work that students do in the electrical shop at the various high schools. It is also related to the type of work that an electrician's helper would do if he were wiring duplex outlets in a wood framed building.

On this work sample, you will attach a conduit connector to an electrical work box, strip insulation from electrical wire, feed wire through a conduit connector, secure the wire to an electrical duplex outlet, attach the duplex outlet to the electrical work box and secure an electrical plate. Your job on this work sample will be to wire up an electrical duplex outlet. I will show you how to do the work in a minute, but first, do you have any questions?

B. Instructions and Demonstrations

Sighted population

<u>STATEMENT</u>	<u>ACTION</u>
Your job is to wire up the electrical duplex outlet	Point to the frame, tools, materials.
Attach the conduit connector to the electrical box	Demonstrate this.
Insert ends of 2 electrical wires into electrical work box through the conduit connector.	Demonstrate this.

<u>STATEMENT</u>	<u>ACTION</u>
Strip insulation from the black and white wires approximately 1/2" from ends. (See gauge on outlet back)	Demonstrate this.
Now insert the wires in the holes on the reverse side of the electrical duplex outlet with white and black wires in their proper holes.	Demonstrate this.
Now secure the electrical plate.	Demonstrate this.
You are finished..inform the evaluator.	
Do you understand the instructions? Go ahead and begin.	

Please return all of the tools to the side of the completed work sample and after I have finished scoring your work, you may disassemble the work sample in the reverse order that you assembled it.

Pick up the stripped pieces of wire and then put all of the tools and materials away. Thank you!

If the student showed an interest and a potential for the work that he did in the Electrical Work Sample, a discussion of the Electrical Shop curriculum should follow.

Post-Sample Interview Topics

1. Did you like working on this work sample?
2. Would you enjoy working on electrical assemblies such as this work sample more often?
3. What did you like least (or most) about this electrical work sample?
4. Did you experience any difficulty in assembling this work sample?
5. Do you need more information about the Basic Electrical I Course?

If you take the Basic Electrical Course offered next year and you pass the course, Electrical Helpers are hired by several electrical contractors located in this general vicinity. All are within a short drive from here and many are within walking distance from here. An Electrician's Helper can start anywhere from minimum wage to \$4.25 per hour, depending upon how well you do. Electrical assembly experience is also gained while employed as an Electrician Helper which could assist you in being promoted.

Follow-up or advanced electrical courses are offered in various high school curriculums as well as the local vocational/technical high school.

IV. SCORING

A. Explanations

1. Method of Scoring:

Productivity will be measured and assessed by comparing total time spent in completing all parts of the work sample. This total time will be compared with those times indicative of students with similar special needs.

Quality will be assessed by the total number of errors made. An error will be assessed by the student's failure to complete any task successfully that he is asked to do, such as:

- Improperly secured conduit connector to electrical work box.
- Improperly feed wires through conduit connector and strip the insulation from the wire.
- Improperly secure the wire to the electrical duplex plug.
- Improperly secure the electrical duplex plug and electrical plate to the electrical work box.

2. Work Performance Factors to be observed:

- Student able to follow verbal instructions accurately.
(or)
- Student able to read and interpret instructions.
- Student able to manipulate hand tools.
- Student able to perform tasks required properly.

B. Forms

Task Observation Record

ELECTRICAL WORK SAMPLE

Task Observation Record

Critical Errors (3 points each)

- _____ 1. Stripped insulation incorrectly
- _____ 2. Improperly secured ends of stripped black and white wires to electrical duplex outlet (6 total)
(3 for each wire)
- _____ 3. Improperly secured electrical duplex outlet to electrical box.
- _____ 4. Used incorrect gauge in wire stripper
- _____ 5. Cut into copper wire with stripper
- _____ 6. Terminal screws touch electrical box.

Observational explanations for 1, 2, 3, 4, 5, and 6.

Task Quality Errors (1 point each)

- _____ 1. Did not strip insulation to 1/2" or by gauge.
- _____ 2. Did not feed wires through conduit connector correctly.
- _____ 3. Did not secure electrical duplex outlet correctly (not tight)
- _____ 4. Did not secure electrical plate correctly (not tight)
- _____ 5. Did not feed back excessive wire
- _____ 6. Used stripper incorrectly
- _____ 7. Used screwdriver incorrectly.
- _____ 8. Incorrectly secured connector
- _____ 9. Turned screw by hand (3 points - 3 screws)

Observational Explanations for 1 through 9.

Put additional comments and observations below.

_____	Critical errors
_____	Task quality errors
_____ Min _____ Sec	Total time
_____	Date taken
_____	Evaluator
_____	Student

V. TECHNICAL DATA

A supplement to this manual is being developed at the time of this printing. It will include:

1. Norms
2. Reliability, test-retest studies
3. Validity
 - a. Content validity - established through the Course Analysis based on methods suggested by U. S. Dept. of Labor Job Analysis techniques.
 - b. Predictive Validity
To be established through follow-up studies of students previously tested.

VI. MAINTENANCE AND CONSTRUCTION

A. Maintenance

After each administration:

- Evaluator should see that all materials and tools are returned to their proper places.
- Pieces of wire and stripped insulation should be picked up and thrown away.
- Frame should be inspected for severe deterioration due to multiple work sample demonstrations.
- Duplex outlet replaced as needed.

B. Materials List

<u>Equipment</u>	<u>Price</u>
6 ft. of #14 wire or similar (#12 etc)	.60
1 electrical work box	1.29
1 electrical duplex outlet	1.29
1 framing stud (2 x 4 x 2 ft)	.25
1 - 6" wood clamp	8.00
1 electrical plate (metal)	1.29
1 screwdriver - regular 6"	3.75
1 wire stripper	5.60
2 wood screws #10 x 1/2 panhead	.15
1 - 3/4 tubing connector	.68
1 - 4" awl	3.95

Source

All above equipment can be purchased at a local electrical supply house. If Work Sample is given in a shop area, then a vice can be used instead of the wood clamp.

C. Assembly Instructions

Prior to the student starting the Electrical Work Sample, the evaluator must set up the fram so that the student can work on it with ease.

1. The evaluator should clamp the frame to a bench or table with the clamp or secure the frame in a bench vice.

VII. REFERENCES

Korn, T. (ed.) A Work Sample Style Manual. Interface No. 10. Menomonic, WI.: Research and Training Center, University of Wisconsin - Stout, 1976.

United States Department of Labor, Dictionary of Occupational Titles, 3rd Edition. Washington, D. C.: United States Government Printing Office, 1965.

Handbook for Analyzing Jobs, Washington, D. C.: United States Government Printing Office, 1972.

Occupational Outlook Handbook, 1970-71 Edition. Washington, D. C.: United States Government Printing Office, 1970.

APPENDIX

Definition of Terms

- GED - Is the general level of learning and reasoning acquired through schools, experience and self study. There are six GED difficulty levels, ranging from (6) the most difficult to (1) the simplest.
- SVP - Is the special vocational preparation and training in terms of the total time required to prepare for an occupation. It ranges from SVP 1, short demonstrations only, to SVP 9, over ten years.
- APT - Refers to aptitudes, which is the quickness and ease with which you can learn to do something. Aptitude definitions are included on a separate page in this manual.
- WA - Work Activities:
1. Dealing with things and objects.
 2. Involving business contacts.
 3. Of a routine, definite, organized nature.
 4. Involving direct personal contact to help or instruct others.
 5. Resulting in recognition or appreciation from others.
 6. Involving the communication of ideas and information.
 7. Of a scientific and technical nature.
 8. Involving creative thing.
 9. Involving processes, methods or machines.
 10. Involving working on or producing things.
- WS - Work situations are the conditions under which the work involved in any occupation takes place. There are ten types described and they have been related to the 66 Worker Trait Groups in the Guide for Occupational Exploration. They are:
1. Performing duties which change frequently.
 2. Performing duties of a routine nature.
 3. Planning and directing an entire activity.
 4. Dealing with people.
 5. Influencing peoples opinions, attitudes, and judgements.
 6. Working under pressure.
 7. Making decisions using personal judgement.
 8. Making decisions using standards that can be measured or checked.
 9. Interpreting and expressing feelings, ideas, or facts.
 10. Working within precise limits or standards.

PD - Physical Demands are the physical requirements of an occupation and are described in six areas as follows:

1. Lifting, carrying, pushing and/or pulling.
2. Climbing and/or balancing.
3. Stooping, kneeling, crouching, and/or crawling.
4. Reaching, handling, fingering, and/or feeling.
5. Talking and/or hearing.
6. Seeing.

WC - Working Conditions are the physical surroundings of a worker in a job. The DOL lists six different types as follows:

1. Inside or outside.
2. Extremes of cold plus temperature changes.
3. Extremes of heat plus temperature changes.
4. Wet and humid.
5. Noise and vibrations.
6. Hazards.

Aptitudes are rated on a scale of 1 - Highest to 5 - Lowest as follows:

- 1 - Top 10% of the population
- 2 - Top third not including the top 10%
- 3 - Middle third of the population
- 4 - Lowest third not including lowest 10%
- 5 - Lowest 10%

The following are the definitions of the aptitudes:

- G - General Learning Ability - The ability to "catch on" or understand instructions and underlying principles; the ability to reason and make judgements. Closely related to doing well in school.
- V - Verbal Aptitude - The ability to understand meaning of words, and to use them effectively. The ability to comprehend language, to understand relationships between words and to understand meaning of whole sentences and paragraphs.
- N - Numerical Aptitude - Ability to perform arithmetic operations quickly and accurately.
- S - Spatial Aptitude - Ability to think visually of geometric forms and to comprehend the two-dimensional representation of three-dimensional objects. The ability to recognize the relationships resulting from the movement of objects in space.
- P - Form Perception - Ability to perceive pertinent detail in objects or in pictorial or graphic materials. Ability to make visual comparisons and discriminations and see slight differences in shapes and shadings of figures and widths and lengths of lines.
- Q - Clerical Perception - Ability to perceive pertinent detail in verbal or tabular material. Ability to observe differences in copy, to proofread words and numbers, and to avoid perceptual errors in arithmetic computation. A measure of speed of perception which is required in many industrial jobs even when the job does not have verbal or numerical content.
- K - Motor Coordination - Ability to coordinate eyes and hands or fingers rapidly and accurately in making precise movements with speed. Ability to make a movement response accurately and swiftly.
- F - Finger Dexterity - Ability to move the fingers, and manipulate small objects with the fingers, rapidly and accurately.
- M - Manual Dexterity - Ability to move the hands easily and skillfully. Ability to work with the hands in placing and turning motions.
- MR - Mechanical Reasoning - The ability to understand mechanical principles (pulleys, gears, etc)
- E - Eye-Hand-Foot Coordination - Moving the hands and feet together in response to visual signals or observations.
- C - Color Discrimination - Seeing likenesses or differences in colors or shades. Identifying or matching certain colors. Selecting colors which go well together.